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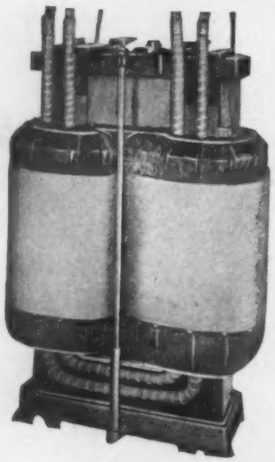

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Two and one-half	K W—2200/1100
Three	K W—2200/1100
Four	K W—2200/1100
Four	K W—2200
Five	K W—2200
Five	K W—2200/1100
Seven and one-half	K W—2200
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Devoted to the Conversion, Transmission and Distribution of Energy.

VOLUME XX. SAN FRANCISCO, CAL., MAY 9, 1908 No. 19

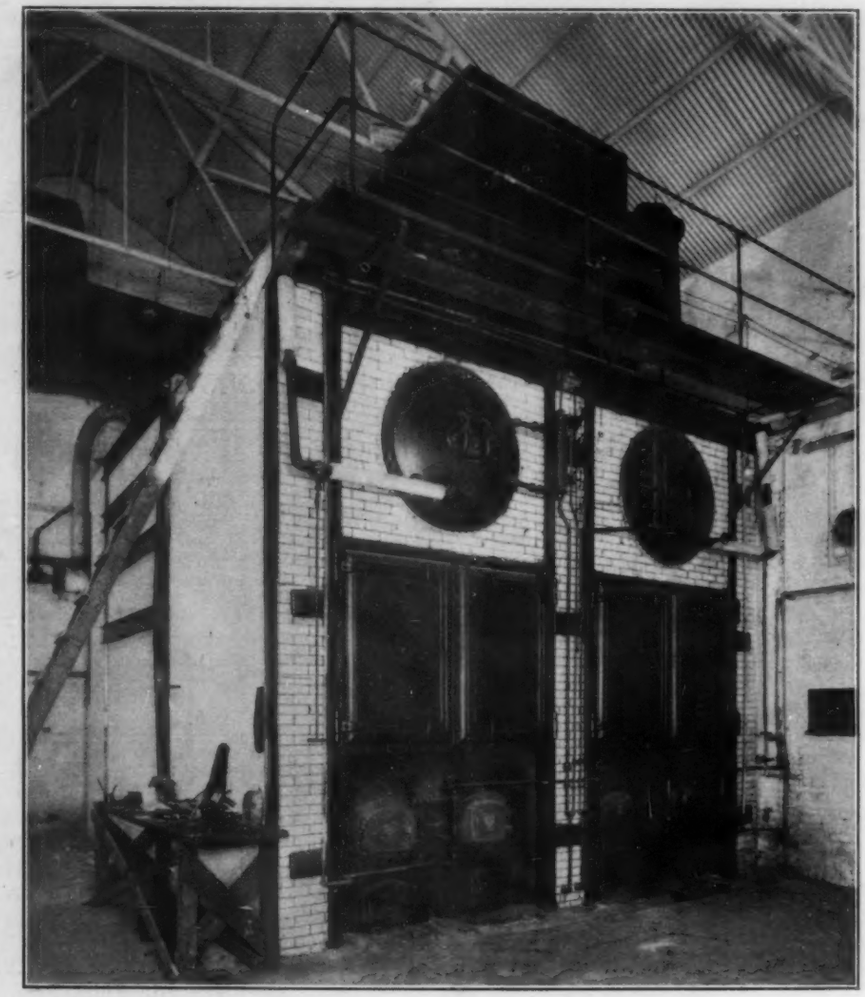
Report of Evaporative Tests on a 200 H. P. Parker Water-Tube Boiler

By R. F. Chevalier*

The main object of these tests was to ascertain the efficiency of the boiler as being operated under commercial conditions with the prevailing furnace arrangement, and after altering same, to determine what per cent had been gained thereby in boiler efficiency, and, incidentally, at what capacity the boiler was being operated. During these tests the boiler was to maintain its operative commercial load, at the plant of the Tubbs Cordage Company, San Francisco.

Boiler.

The boiler tested is known as "Boiler No. 2," or the "South Boiler." It is a Parker water-tube boiler, builders' rating 200 horsepower. The boiler is 12 tubes wide and 8 high, tubes being 4 inches in diameter, 18 feet long, and horizontal. There is one horizontal drum 20 feet long and 18 inches in diamater.



PARKER WATER-TUBE BOILER

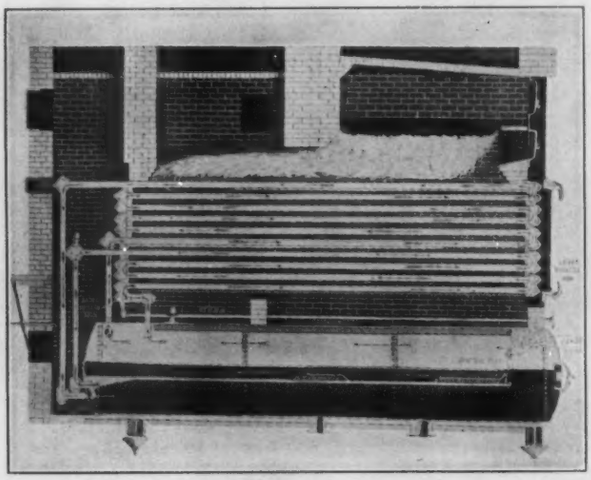
This drum is divided by a diaphragm of quarter inch steel plate, riveted to the shell. This diaphragm extends from the rear head to within 2 feet of the front head, and to this end and to the lower half of the drum is riveted a vertical steel plate, forming the diaphragm head, thereby making two separate chambers. In this head is a manhole, to which a cover is hinged on the inside, and when closed makes a water-tight joint. This swinging manhole cover acts as a non-return or anti-priming valve. Its function is to allow the water in the upper half of the drum to enter the lower, but to prevent any return to the former. The space between the diaphragm head and the drum head proper acts as a scale pocket. The upper half or section in the drum is known as the steam space, the lower as the water space. In the latter is a rectangular box, which is connected to the feed element by a nipple that passes through the shell directly underneath it. The feed water enters the drum through the front head and is discharged into this box by means of an internal feed pipe.

The tubes are divided into five elements. The upper or feed element acts as an economizer. It is 2 tubes high and 8 wide. Its function is to heat the feed water, which enters through the drum and is discharged into the internal box as above described, the latter having a non-return or check valve to prevent the feed water from entering the drum, thereby forcing it into the tubes of the element. This non-return valve is so arranged that, in event of the feed being interrupted or lessened, the water from the drum enters the box, enabling the circulation to continue.

The flow in the element is forward and back, alternately, through each tube in the top row, then down to the next row, finally discharging through a vertical upcast into the rear drumhead above diaphragm. The water flows along diaphragm into the scale pocket, through the swinging manhole into the lower or water chamber of the drum. The blow-off connection is made at the bottom end of the feed element, and solid water can be forced through the entire element under full boiler pressure. The lower elements, four in number, which are 6 tubes high and 3 wide, receive this heated water and convert it into steam. The water coming down from the drum enters two headers, each of which controls two of the elements, and passes through non-return check valves, which maintain a counter-flow, and then on down through the tubes. The lower end of each element is connected by a separate upcast to the

*Consulting Engineer, Alameda, Calif.

steam chamber of the drum. This steam is then led to a fitting, from which a 4-inch tube carries it down to a superheater header, and after passing through the superheater tubes, of which there are sixteen, 1¼ inches in diameter and 12 feet long, is collected in another header, from which a 4-inch tube carries it through to the stop-valve casting. There is a flooding device and a drain on the superheater element. This superheater is located on the rear of the furnace below the lower row of tubes. The heated gases of combustion come in contact with it at a very high temperature, as only a small percentage of the heating surface has been traversed by the same before reaching the superheater. Two of these units comprise the entire battery. At the time the tests were made, the factory was running at two-thirds capacity, therefore only one boiler was being operated. Both boilers are operated when the factory is running full.



PARKER WATER TUBE BOILER SHOWING WATER CIRCULATION WITH FEED DIRECT TO ELEMENT.

The Furnace.

Is of the ordinary type such as used for coal burning. On the grate bars were placed whole fire bricks, laid in loosely to allow the admission of air for combustion. This arrangement did not conform to any standard. The flame was long and narrow, spreading at the rear of the furnace directly under the opening of the first pass.

Alterations to Furnace.

Consisted in rearranging the loose brick on the grate bars. The whole fire bricks were replaced by soap bricks, so that the air entering might be better distributed. The long flame was changed to a short one, spreading as it left the tip of the burner, and coming in contact with the vertical side walls of the furnace within three feet of the front. With the long flame, the superheater tubes were walled in with fire bricks, as the superheat was too high otherwise. When the short flame was adopted, this wall was removed and a checker work placed in front of the superheater in order to protect it from the direct impingement of the flame. A wall of loose fire brick was built on the sides of the furnace in order to protect the original walls from the action of the flame. The area, consequently the volume, in the front of the furnace was increased by lowering the grate bars and adjoining brick work, thus forming a pit, which rises again to the original level of the furnace at a point near the superheater.

Dimension and area of furnace and air setting as altered are shown on attached print, plates No. 1 and 1A.

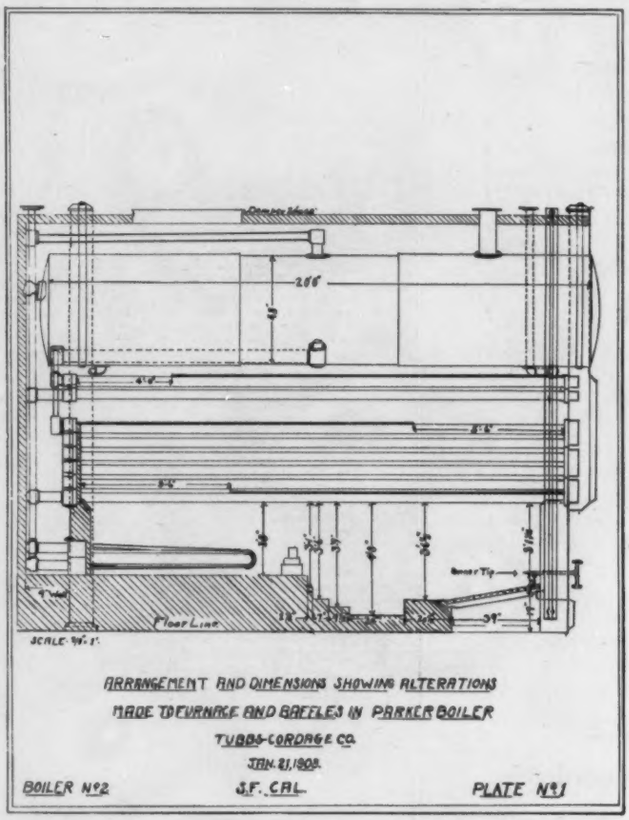
The Burner.

Is of the internal-mixing type known as the "Owen's." It is divided into two channels; the upper one contains the oil; the lower, the steam. At the end of these is a plate having small perforations, the larger number or greater area of perforations being on the bottom where the steam passes through. After the oil and steam leave this plate, they enter a hollow tube or pipe, which is used as a mixing chamber, at the end of which is a slot whereby the mixed oil and steam pass into the furnace in a fan-shaped flame.

Water-Heating Surface of Boiler.

The heating surface was determined by actual measurement. All surfaces of the boiler in contact with water on one side, and flame and hot gases on the other, were taken into consideration, and are tabulated below.

Diameter of tubes, 4 inches; circumference, 1.05 feet.



Tubes in First Pass.

1 high, 12 wide, 16½ feet of tube exposed to gases.
Area of one tube, 17.32 square feet.
Area of twelve tubes.....208 sq. ft.

Tubes in Second Pass.

5 high, 12 wide, 17½ feet of tube exposed to gases.
Area of one tube, 18.38 sq. ft.
Area of sixty tubes.....1,102.2 sq. ft.

Tubes in Third Pass.

2 high, 12 wide, 18 feet of tube exposed to gases.
Area of one tube, 18.9 sq. ft.
Area of twenty-four tubes.....453.6 sq. ft.
Area of tube leading from drum to feed element . . .. 9. sq. ft.

Drum.

48-inch diameter, 19 feet exposed to gases.
Area of drum exposed to gases, 237.5 sq. ft.
Area of ½ circumference of drum exposed to gases . . ..118.7 sq. ft

Total Water-Heating Surface.....1,891.5 sq. ft.

Superheating Surface.

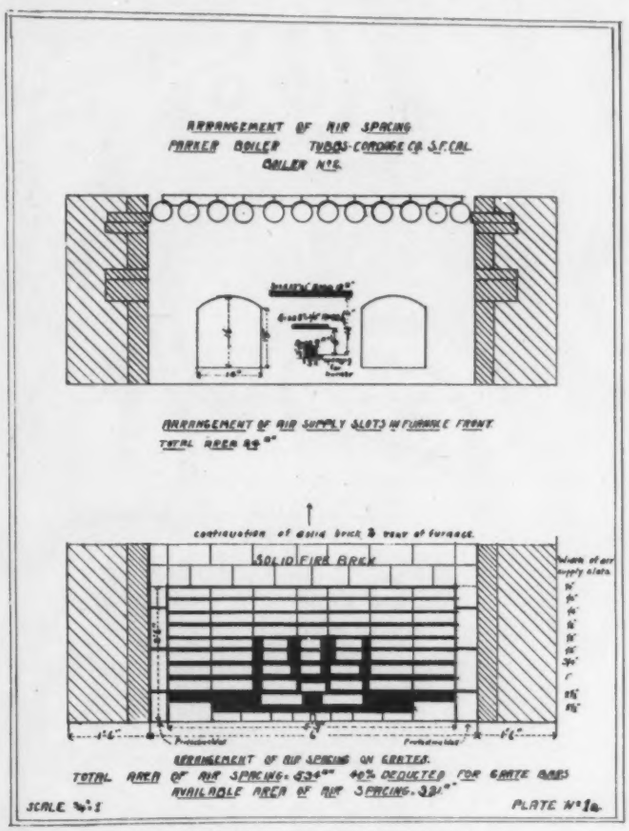
The superheating surface was also obtained by measurement, the actual surface exposed to gases being 62 square feet.

Rating of Boiler.

The builder's rating of the boiler is 200 horsepower. On this rating is based the per cent of overload. The rate of evaporation per square foot of heating surface is determined from the measurements as tabulated above.

Quality of Steam.

Superheated. Observations of the temperature of the superheated steam were taken by a thermometer placed in a well situated in the main steam pipe line, a short distance from the boiler stop valve. As will be noted, this temperature remained nearly constant throughout variable load con-


ARRANGEMENT OF AIR SPACING
PARKER BOILER TUBES-CORDAGE CO. S.F.CAL.
BOILER No. 6.
ARRANGEMENT OF AIR SUPPLY SLOTS IN FURNACE FRONT
TOTAL AREA 43"
continuation of solid brick 3 rows of furnace.
SOLID FIRE BRICK
ARRANGEMENT OF AIR SPACING ON GRATES.
TOTAL AREA OF AIR SPACING = 434" 40% DEDUCTED FOR GRATE BARS
AVAILABLE AREA OF AIR SPACING = 321"
SCALE 3/4" = 1'
PLATE No 1a.

AIR SPACES SHOWN IN BLACK.

ditions of the boiler, the extreme variation being 12 degrees P. throughout a range of 40 boiler horsepower. Reference to the steam table had to be resorted to in order to determine the normal temperature of the steam due to the average observed gauge pressure during the test, as after the test when the fire was extinguished the superheat did not disappear, though the pressure dropped below the observed average. In the calculations for the quality of steam, the specific heat of the superheated steam was assumed as forty-eight hundredths (.48).

Apparatus for Handling and Weighing the Feed Water.

The feed water was taken from the cooling tower by gravity and weighed in a barrel placed on a pair of standardized platform scales. The scales were placed on the top of the hot well, and the water, after being weighed, emptied therein. When the test was started, the level of the water in the hot well was noted. The level was maintained at the end of each hour as well as at the end of each test. From the hot well a belt-driven duplex pump took the water and fed it through a closed heater to the boiler. The water level in the boiler was maintained constant, this being facilitated by a by-pass valve placed in the feed pipe before the water entered the heater, the discharge from this by-pass valve leading back to the hot well. This valve was regulated by the fireman so that a constant level was maintained. As the only other connection in the feed line was the discharge from an auxiliary pump, possibility of any leakage occurring was guarded against by having a drain open between this pump and its discharge valve. The outlet of the blow-off and the drains from the water column and gauge glass were in plain view. They were carefully watched, no leakage occurring from either one of these points.

Apparatus for Handling and Weighing Fuel Oil.

This consisted of a pair of standardized platform scales, on which the weighing barrel was placed and the supply of oil pumped from the storage tank into same as required. From this barrel the oil was run by gravity into a second barrel, from which it was taken by a pump, passed through the heater, then to the burner. This oil pump was fitted with an automatic relief valve, by means of which a constant pressure was maintained in the oil line to the burner. The discharge from this relief valve led back to the barrel from which the suction of the pump was taken. As the oil was discharged from the weighing barrel, a small sample was collected. This operation occurring twice an hour, the sample collected represented the average quality of the oil used during the test.

Steam for the Burners.

The amount of steam used by the burner for atomizing the oil was determined only in test No. 5, as the apparatus for securing the necessary data had not been arranged for test No. 1. This steam was passed through an orifice on either side of which was a steam gauge. During the test these gauges were read every fifteen minutes. When the test was completed, steam was passed through the same orifice, under duplicate conditions, and condensed. The condensation was weighed, thus obtaining the average weight per hour. This was saturated steam taken directly from the drum of the boiler.

Heat Value and Characteristics of the Fuel.

The heat value of the oil was determined with a Parr calorimeter. Three tests were made of each sample, and the average results taken.

In order to determine the percentage of moisture in the oil, 100 cubic centimeters were placed in a distillation flask and gradually heated to a temperature of 150 degrees Centigrade. The distillate collected in a graduated tube, and the resulting water was measured. The gravity was determined by a hydrometer, Beaume scale.

The above determinations were made by the writer at his laboratory.

Instruments Used in Tests.

The boiler room steam gauge was compared with a test gauge, and found to be correct. All thermometers were correct, the same being calibrated by the writer periodically. Both flue gas thermometers were alike when compared.

Flue Gas Analyses.

Analyses of the gases of combustion were made during each test in order to determine the relative values of the air spacing in the furnace. The Orsat apparatus was used, and determinations of carbon dioxide and free oxygen were made, and only a few of carbon monoxide, as in rare cases was any of this gas present, and then only a trace.

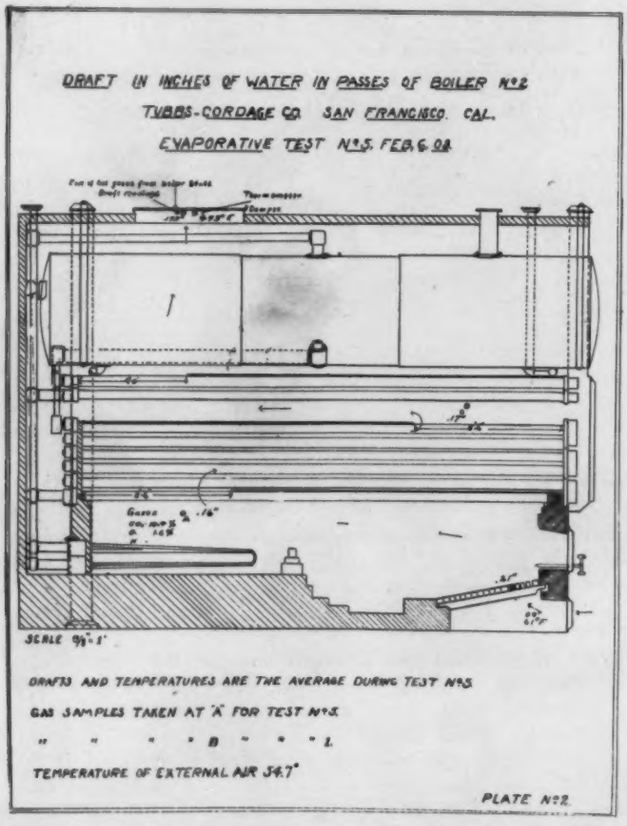
Although the object of rearranging the furnace was to decrease the amount of excess air entering for combustion, thereby increasing the percentage of carbon dioxide, attention is called to the fact that in test No. 1 samples of gases were collected from the front of the boiler in the second pass. In test No. 5, samples were taken at the rear of the

furnace just before the gases entered the first pass, a hole having been drilled through the brick setting for the purpose of inserting the sampling tube.

Owing to the different locations from where the samples were taken in the two tests, a true comparison could hardly be made, so, during test No. 5, in order to obtain a comparison, three samples were collected from the same location as in test No. 1. The average composition is as follows:

Average of Three Samples of Dry Gases Taken From Second Pass in Test No. 5.

Carbon dioxide	13.6%
Oxygen	2.6%
Carbon monoxide	0.
Nitrogen	83.8%
Per cent of excess air	13. %


DRAFT IN INCHES OF WATER IN PASSES OF BOILER No 2
TUBBS-CORDAGE CO. SAN FRANCISCO. CAL.
EVAPORATIVE TEST Nos. FEB. 6. 08
SCALE 3/4" = 1'
DRAFTS AND TEMPERATURES ARE THE AVERAGE DURING TEST No 5
GAS SAMPLES TAKEN AT 'A' FOR TEST No 5.
" " " " B " " " 1.
TEMPERATURE OF EXTERNAL AIR 54.7°
PLATE No 2.

Average Samples of Dry Gases Taken From Second Pass Test No. 1.

Carbon dioxide	11.8%
Oxygen	5. %
Carbon monoxide	0.
Nitrogen	83.2%
Per cent of excess air	28. %

Gas Passages in Boiler, Flue, and Stack.

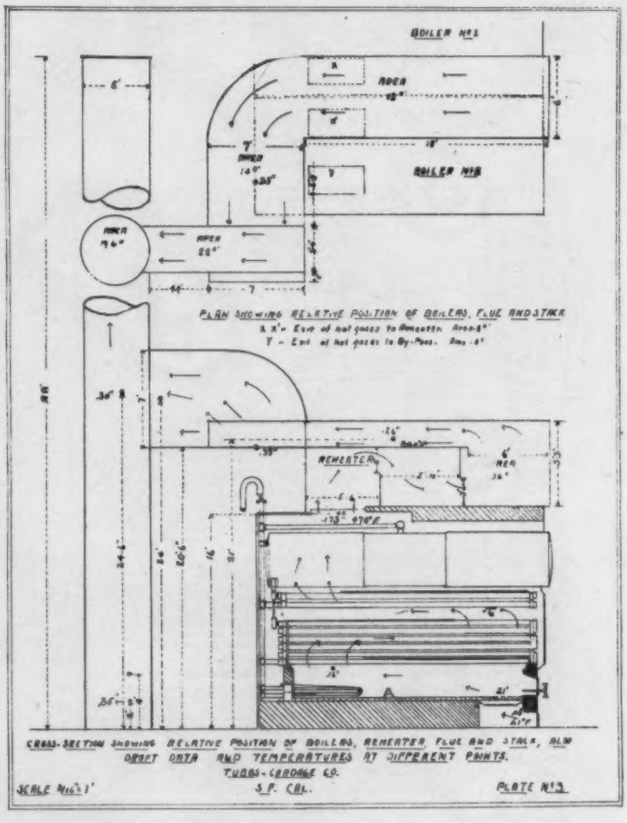
The baffles were arranged horizontally over the tubes, as prevailing in the Heine type of boiler. There are three rows of baffles, making three passes. For arrangement and dimensions, see plate No. 1.

In the flue arrangement is a reheater. Its function is to utilize the waste heat in the escaping gases from the boiler by increasing the temperature of the exhaust or receiver steam from the high-pressure cylinder of the main engine before it enters the low. This reheater is so arranged that the hot gases from the boiler pass through it, then make two right-angle turns into a flue over the reheater, doubling back to a cross flue at right angles to the reheater flue, and then make another right-angle turn into a flue leading to the stack. The height of the stack is 88 feet above boiler-room floor, diameter 5 feet. Between the boiler and the flue, over the reheater, is a by-pass used when raising steam or when there is no steam passing through the reheater tubes. For size and general arrangement of the boilers, reheater and flues, see plate No. 3.

Observations.

The following observations were taken every thirty minutes:

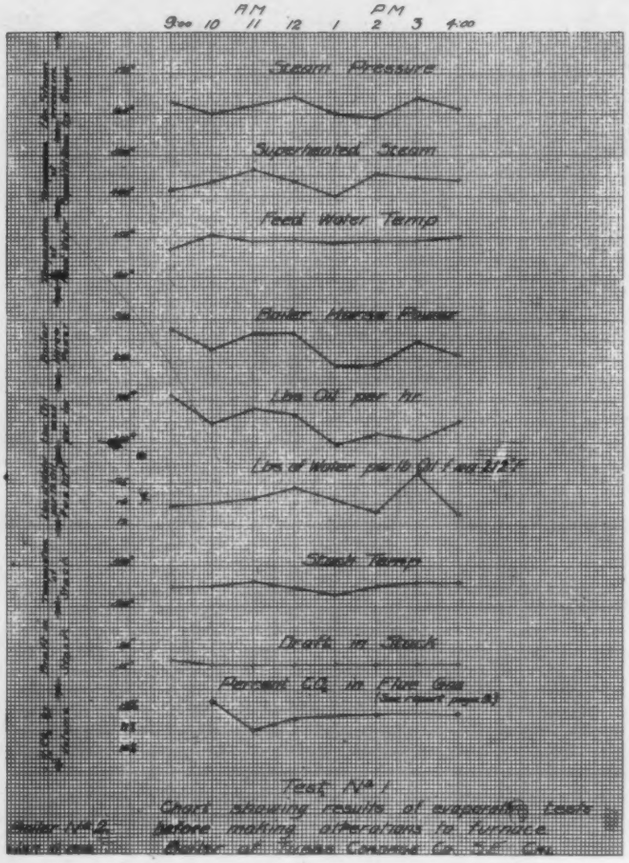
Steam pressure.
Oil pressure.
Draft pressure.
Water level in gauge glass.
Temperature of feed water.
Temperature of oil.
Temperature of flue gases.
Temperature of air entering ash pit.
Temperature of boiler room.

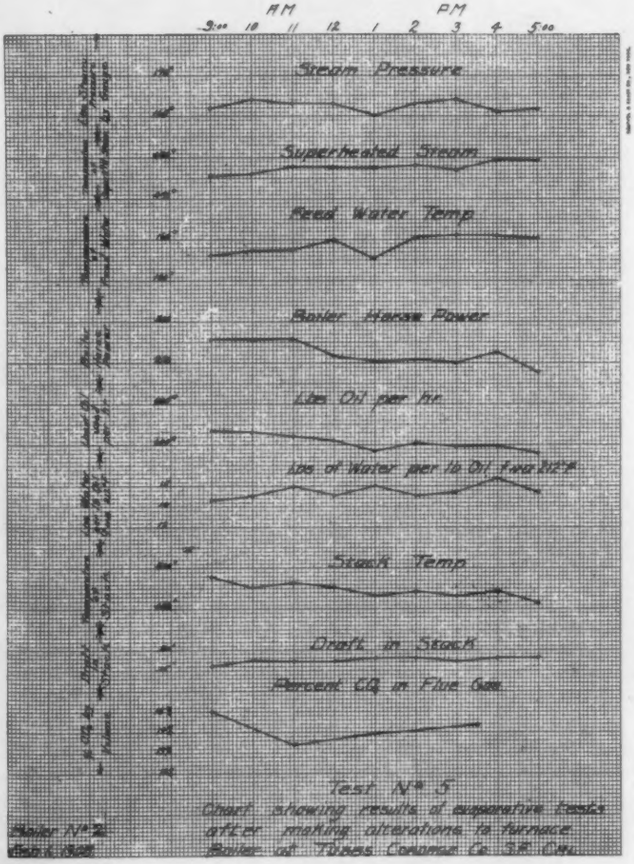

BOILER No 1
BOILER No 2
REHEATER
PLAN SHOWING RELATIVE POSITION OF BOILERS, FLUE AND STACK
CROSS-SECTION SHOWING RELATIVE POSITION OF BOILERS, REHEATER, FLUE AND STACK, ALSO DRAFT DATA AND TEMPERATURES AT DIFFERENT POINTS.
TUBBS-CORDAGE CO.
S.F. CAL.
PLATE No 3

Temperature of external air.
Temperature of superheated steam.

Tests.

There were five tests made. Numbers one and five, the data of which are given in this report, are the principal ones. Tests numbers two, three, and four were preliminaries and of three hours' duration, made only to determine the relative values of the different types of flame. All the tests were made under operating conditions. Test number one was of eight hours' duration, and number five of nine hours' duration. At the start and finish of both tests the fire was maintained constant; if it had been extinguished to equalize the furnace conditions, a stop of at least three minutes would have been necessary, and this would have reduced the steam pressure considerably. The state of the fire was maintained constant for a period of five minutes before the beginning and finish of each test. The water level was measured at the beginning and end of each test and maintained nearly constant throughout the run, this being facilitated by the by-pass valve previously mentioned. Attached to this report will be found charts showing graphically the logs of the tests by which the hourly records and performances of the boiler can be noted.


AM
PM
9:00 10 11 12 1 2 3 4:00
Steam Pressure
Superheated Steam
Feed Water Temp.
Boiler Horse Power
Lbs. Oil per hr.
Lbs. of Water per lb. Oil from and at 212°F.
Stack Temp.
Draft in Stack
Percent CO2 in Flue Gas
Test No. 1
Chart showing results of evaporative tests before making alterations to furnace.
Boiler No. 2.


AM
PM
9:00 10 11 12 1 2 3 4 5:00
Steam Pressure
Superheated Steam
Feed Water Temp.
Boiler Horse Power
Lbs. Oil per hr.
Lbs. of Water per lb. Oil from and at 212°F.
Stack Temp.
Draft in Stack
Percent CO2 in Flue Gas
Test No. 5
Chart showing results of evaporative tests after making alterations to furnace.
Boiler No. 2.

DATA AND RESULTS OF EVAPORATIVE TESTS ON A PARKER WATER-TUBE BOILER, TUBBS CORDAGE CO., SAN FRANCISCO.

Tests made by R. F. Chevalier. Kind of fuel, California crude oil, Standard Oil Company's "Fuel Oil." Method of starting and stopping tests, running. Water-heating surface, 1,891 square feet. Superheating surface, 62 square feet.

	Before Alterations.	After
Date of trial, 1908	Jan. 10.	Feb. 6.
Test number	1	5
Boiler No.	2	2
TOTAL QUANTITIES.		
Duration of tests, hrs.	8	9
Weight of oil as fired, lbs.	5,190.	5,504.
Percentage of moisture in oil, per cent.	.6	1.7
Total weight of oil consumed, corrected for moisture, lbs.	5,158.9	5,410.5
Total weight of water fed to boiler, lbs.	61,960.	68,641.
Water actually evaporated corrected for superheat in steam, lbs.	66,006.	73,013.
Factor of evaporation	1.1901	1.1802
Equivalent evaporation from and at 212° F., lbs.	73,739.	81,010.
HOURLY QUANTITIES.		
Oil consumed per hour as fired, lbs.	648.7	611.5
Oil consumed per hour corrected for moisture, lbs.	644.8	601.1
Water evaporated per hour, lbs.	7,745.0	7,626.7
Equivalent evaporation per hour from and at 212° F., lbs.	9,217.0	9,001.0
Same per square foot of water-heating surface, lbs.	4.87	4.75
Steam used by burner per hour (saturated), lbs.		276.
Steam used by burner per cent steam generated (saturated)		3.6
AVERAGE PRESSURES, TEMPERATURES, ETC.		
Steam pressure by gauge, lbs.	161.7	162.9
Oil pressure at burner, lbs.	78.0	100.0
Force of draft between damper and boiler, inches	0.16	0.173
Force of draft in ash pit, inches	0.12	0.08
Force of draft in furnace, inches	0.14	0.21
Temperature of external air, degrees	57.0	54.7
Temperature of boiler room, degrees	60.5	63.8
Temperature of air entering ash pit, degrees	57.6	61.0
Temperature of flue gases at damper, deg.	525.6	473.0
Temperature of flue gases after reheater, degrees	352.3	319.0
Temperature of superheated steam, degrees	487.0	484.0
Temperature of steam before superheater corresponding to pressure on boiler gauge, degrees	371.0	371.7
Number of degrees of superheating, degrees	116.0	112.3
Temperature of feed water, degrees	147.8	155.3
Temperature of fuel oil at burner, degrees.	130.0	130.0
Average water level above bottom of glass, inches	6.	6¾
BOILER HORSEPOWER.		
Horsepower developed A. S. M. E. rating, b. h. p.	267.	260.8
Builder's rated horsepower, b. h. p.	200.	200.0
Per cent of builder's rating developed, per cent	133.	130.0
ECONOMIC RESULTS.		
Water apparently evaporated under actual conditions per pound of oil as fired, lbs.	11.93	12.47
Equivalent evaporation from and at 212° F.—		
Per pound of oil as fired, lbs.	14.2	14.71
Per pound of oil, corrected for moisture, lbs.	14.29	14.97
EFFICIENCY.		
Calorific value of dry oil per pound, B. T. U.	18,363.	18,409.
Efficiency of boiler based on oil corrected for moisture, per cent	75.1	78.5
COMPOSITION OF FLUE GASES.		
Carbon dioxide by volume, per cent.	11.8	14.2
Carbon monoxide by volume, per cent.	0.0	0.0
Oxygen by volume, per cent.	5.0	1.8
Nitrogen by volume, per cent.	83.2	84.0
PROPERTIES OF FUEL OIL.		
Gravity of oil, Beaume	16.2°	16.°
Percentage of moisture, per cent.	.6	1.7
Calorific value of dry oil, B. T. U.	18,363.	18,409.
PER CENT GAIN.		
Gain in efficiency, per cent.		4.5

Remarks.

In conclusion, attention is called to the fact that this boiler is not operated under conditions conducive to high efficiency, as the factory is started at seven o'clock in the morning and run until noon, and shut down for three-quarters

of an hour, then again started and closed down at five o'clock, when the fires are extinguished. This causes the brick walls to cool off considerably, and the heat thus lost must again be absorbed during the day's run. Throughout the tests, the regular fireman operated the burner. No more than the usual attention was given to the cleaning of the soot from the tubes, which is blown off in the mornings by a steam jet.

Attention is called to the constant overload on this boiler, also the variation of the load. The latter in itself is detrimental to high boiler efficiency. It will also be noted that the draft at the damper is very small, having only sixteen to seventeen hundredths of an inch (3/16 inch) of water, observations of which were made with an Ellison draft gauge.

The internal surfaces of the boiler were thoroughly cleaned before test number one, and the boiler was not opened again until after test number five was completed. The boiler had been operating five days from the time of cleaning when test number one was conducted, and twenty-one days at the time of test number five. After the last test, the boiler was opened, and a slight coating of scale was found in the bottom row of tubes, thickness of same being less than one thirty-second of an inch (1/32 inch). All the other tubes were clean. No scale nor soft mud was found in them. It had been deposited in the scale pocket.

RELATIVE VALUE OF COAL AND OIL USED AS FUEL.

By R. F. Chevalier.

The relative commercial value existing between coal and oil as fuel, irrespective of the cost of handling, is shown by the following data. This data is taken from tests made on the same type of boilers ("Parker Water Tube"). The test on the boiler using coal was conducted by Prof. H. W. Spangler, at the Philadelphia Rapid Transit Company, Philadelphia, Pa.; that on the boiler using oil as fuel, by the writer, at Tubbs Cordage Company, San Francisco. The data given is taken from one of a series of tests, and shows the maximum efficiency obtained with the boiler under commercial operating conditions and a variable load. These conditions are described in the article on the report of tests in this issue of the "Journal."

As the rating of the boiler using coal is 700 brake horsepower, and that of the one using oil only 200 brake horsepower, naturally the highest efficiency would be obtainable with the former; thus the coal is favored. The coal-burning boiler was equipped with a mechanical stoker, and it is interesting to note the relative amount of steam used to operate the stoker and that used by the burner to atomize the oil.

It is also interesting to note the comparison of the compositions of the gases of combustion and the per cent of excess air above the amount theoretically required for perfect combustion by the different fuels. The per cent of builder's rating developed was practically the same, and the steam was superheated in both instances.

The coal used was fine anthracite. The oil was California crude oil as sold by the Standard Oil Company for fuel purposes, and from which the lighter hydro-carbons had been distilled. The heat value and other data pertaining to the fuel, as well as a comparison of the results and efficiencies obtained with same, are shown in the following tabulation:

FUEL.	Coal.	Oil.
Gravity of oil, Baume		16.2°
Per cent of moisture in fuel	3.9	1.5
Per cent of ash	17.87	
Calorific value by Parr Calorimeter per pound of dry fuel, B. T. U.	11811.	18099.
BOILER HORSEPOWER.		
Horsepower developed, A. S. M. E. rating	832.3	241.
Builder's rated horsepower	700.	200.
Per cent of builder's rating developed	118.9	120.
ECONOMIC RESULTS.		
Water apparently evaporated under actual conditions per pound of fuel	7.118	13.12
Equivalent evaporation, F. & A., 212° F. per pound of fuel	9.0767	15.11
Same per pound of dry fuel	9.4451	15.34
Same per pound of combustible	11.83	15.34
EFFICIENCY.		
Efficiency of boiler	82.76	81.8
Per cent of steam generated used by stoker	5.8	
By burner		3.58
ANALYSIS OF DRY GASES BY VOLUME.		
	Coal.	Oil.
Carbon dioxide	7.82	14.6
Oxygen	7.50	1.2
Carbon monoxide	.13	.00
Nitrogen	84.55	84.2
Per cent of excess air above amount theoretically required	50.	5.6

Assuming the cost of coal to be $4.00 per long ton, and the cost of oil to be $1.00 per barrel, the following comparisons can be deducted:

From the results as above tabulated, we have an evaporation of 222.5 pounds of water per gallon of oil, cost of this gallon being $0.024. An equivalent evaporation required 23.57 pounds of coal, at a cost of $0.042. This places the fuel value of oil at $0.042 per gallon.

SINGLE-PHASE RAILWAY.

Discussion.

By W. F. Lamme.

In the discussion by Mr. Babcock of the report of the committee appointed by the San Francisco branch of the American Institute Electrical Engineers to investigate the San Francisco, Vallejo & Napa Valley Railroad, he made statements as follows:

1. "Under starting conditions, with 65 kilowatts input into the motors at 0.38 power factor, and 2,720 volts at the motor, the line drop was 1,103 volts, and the line energy loss 69.5 kilowatts, or 51.7 per cent. Possibly this excessive line loss explains why the energy costs increase with the load factor."

2. "Under running conditions at about six hours thirty-five minutes, there was a line drop of 363 volts, an energy loss of 30.3 kilowatts on an input of 245 kilowatts to the motors, or 11.7 per cent energy loss on the line. The power factor at the care was then 0.931."

3. "Averaged over the entire cycle named, the line drop is 483 volts, the average line loss 42.6 kilowatts, with an energy input of 218.2 kilowatts, or an energy loss of 16.3 per cent."

In the first paragraph of the above quotation, the current on the trolley at starting was 63 amperes. If 63 amperes were drawn from the trolley line at the Vallejo end without any conductor in the circuit except the 000 trolley and the rails, the energy voltage loss would be less than 400 and the line energy loss less than 25 kilowatts. Therefore, there must be some error in the figure of 1,103 volts line drop and line energy loss of 69.5 kilowatts.

In order to arrive at the value of 1,103 volts line drop, Mr. Babcock must have used a diagram as follows:

If the above diagram is the one which has been used, then the error is quite plain.

The above diagram presupposes 3,300 volts on the trolley at the generator, and that there is no inductance in the line from the generator to the car. The latter presupposition is, of course, incorrect, as the overhead lines, the transformers, and the rails all have inductance, and this is especially so in the rails.

In this specific case the car was supplied by the transformer located near Vallejo, and was approximately five (5) miles from it. There is a break in the trolley line between this point and Napa, so the total load was on the transformer near Vallejo.

Reducing the high-tension transformer feeder system, the transformer itself, and the trolley system all to one diagram, we then have a double diagram, as follows:

The above diagram gives a line energy voltage loss of 195 against 1,103. That is, with 195 volts and 63 amperes, the line loss equals 12.3 kilowatts. This 12.3 kilowatts is less than 20 per cent of 65 kilowatts, the input to the car motors at starting.

In the second paragraph quoted, we are informed that, "with 245 kilowatts to the motors, the line loss equals 30.3 kilowatts, and the per cent energy loss on the line equals 11.7 per cent."

The correct values for the above make the energy line loss 25.1 kilowatts and the percentage line loss 9.3.

As to the "average over the entire cycle" referred to in the third paragraph, the average line loss is 21.9 kilowatts instead of 42.6 kilowatts, and referring this loss to the energy input of 218.2 kilowatts, we have 9.1 per cent loss instead of 16.3 per cent.

In the "Proceedings of the American Institute Electrical Engineers" for March, 1907, Mr. Babcock made a statement as follows:

"If this road had been equipped with 1,200 volts direct current, under the same operating conditions and losses in transmission as are now made, the energy per ton mile would have been 107 watt-hours as against 153 actually recorded, and the monthly cost of energy would have been reduced in proportion."

The 1,200-volt direct-current equipment is not as efficient as the same size 600-volt equipment, neither is the equivalent alternating-current equipment so efficient as the 600-volt direct current.

In the following figures it is assumed that the 1,200-volt direct-current and the alternating-current equipments are of the same efficiency.

The four-motor alternating-current equipment is heavier than the four-motor direct-current equipment. This amounts to approximately seven (7) per cent of the total weight of the car loaded and the equipment, and it therefore takes seven (7) per cent more energy at the car than a 1,200-volt direct-current equipment would take.

The generators of the motor generator sets and the line transformers make approximately two and one-half (2½) per cent difference in efficiency in favor of the direct current.

If we have the same transmission losses in the two cases, then the alternating-current equipment will take approximately ten (10) per cent more car motor energy input into the motor generator sets than the direct current will take.

In the first quotation above (third paragraph), 218.2-kilowatt alternating current was delivered to the car. This was at a point where the car was fed from a transformer near Vallejo, delivering energy back to approximately one mile from the trolley break. Therefore, this is close to the point on the trolley system where the line losses, due to the length of conductor, are the greatest. This point is the equivalent of approximately one mile from the outer terminus in case of the direct current, or, say, 13½ miles from the power-house.

With 218.2 kilowatts delivered, the line losses were 21.9 kilowatts. The direct-current equipment requires seven (7) per cent less energy at the car than the alternating current. That is, in the above case, the direct-current equipment would require 203 kilowatts at the car. With 1,200 volts on the trolley, 203 kilowatts requires 169 amperes; 21.9-kilowatt line loss with 169 amperes on the line permits only 130 volts drop.

Two 60-pound rails in parallel give a drop of 169x13.5x.044, equals 100 volts. Therefore the permissible overhead drop equals 130 minus 100, or 30 volts. To secure this 30-volt drop on the overhead construction requires a conductor equal to 4,000,000 centimeters, about $12,000 per mile, which is prohibitive in the case of such a road as this.

But let us give the direct-current proposition the benefit of the ten (10) per cent saved in the total direct-current car and conversion equipment, equals 21.8 kilowatts. Now, there is an allowable line loss of 43.7 kilowatts. This permits a total drop of 260 volts, and the overhead copper now reduces to 790,000 centimeters. There is already installed 380,000 centimeters, so there is yet required 410,000 centimeters, or $1,180 per mile additional for copper, a total of $17,000 at the time this road was built. From this we should deduct $3,000 for line transformers, leaving a total of $14,000 yet to be expended for copper in order to make the cost for power of the direct-current equipment equal to the alternating current.

The above refers to the Vallejo end of the road. At the St. Helena end, in order to make the cost at the input side of the motor-generator sets the same, it would require 1,300,000 centimeters of copper, of which 275,000 centimeters is already installed. That is, approximately $3,100 per mile, or a total of $59,000. Against this should be charged $4,000 for transformers, leaving $55,000 yet to be invested in conductor to make the direct-current energy consumption equal to alternating current.

Therefore, with 400-kilowatt motor-generator sets and equivalent four-motor car equipments and the same losses in transmission, the direct-current 1,200 volt is prohibitive on account of the cost of conductor; but if all loss differences between the alternating-current and direct-current car equipments and converting equipments be added to the alternating-current line losses, and this sum be made the direct-current line losses, still an additional expenditure of $69,000 for conductor must be made in order to bring the cost for energy direct current down to the cost for energy alternating current.

REPLY TO MR. LAMME'S CRITICISM OF MR. BABCOCK'S DISCUSSION.

By A. H. Babcock.

In making my discussion of the results of the committee's work on the San Francisco, Vallejo and Napa Valley Railroad installation, I used the data furnished by the committee. It appears that there are other ways of interpreting the results of their work. I do not care to argue the elements of vector analysis or to enter into an academic discussion of any matter

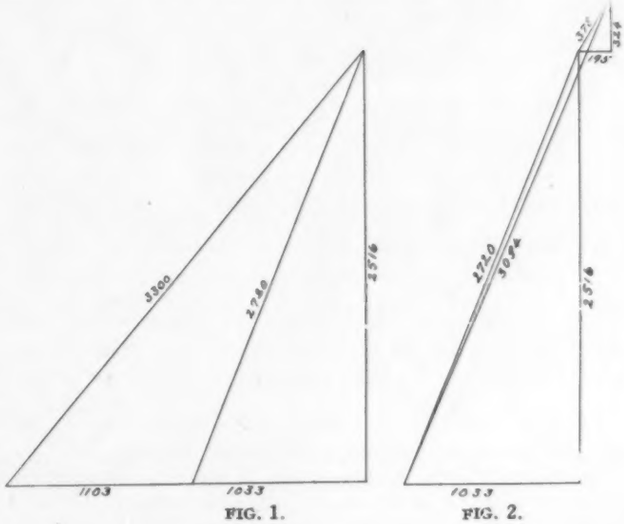


FIG. 1.

FIG. 2.

where the conditions precedent are capable of various interpretations, because by assuming a suitable interpretation of conditions any desired result may be reached. In any event, what is the use? The facts are that the cars are now operating at about double the energy cost per car-mile for which they could be operated under other conditions. It appeared to me from the committee's results that the difficulty lies in the line, and by the line is meant all the apparatus between the car and the source of supply of power. Mr. Lamme has decided that it is not in the line. The only other possible location is in the car equipment or the motors. If he would rather have it there, I am perfectly willing.

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VOL. XX MAY 9, 1908 No. 19

EDITORIAL.

STEAM FROM FUEL OIL.

The potentiality of Pacific petroleum for steam generation, much less its actuality, has not yet even trickled to the Atlantic intellect through the ordinary pipe lines of communication, should we accept the editorial comments of the contemporary technical press as a criteria. The cumulative advantages of cheaper handling, smaller storage, ashless burning, and perfect pressure control are met by arguments, antiquated and narrow, of alleged supply shortage, high cost, and waste of steam.

The last-century contention that the "entire oil production of the country would not keep the Pennsylvania Railroad going," is too old and feeble to long dam the present annual production of 130,000,000 barrels. This is being augmented by extension in area and an increased daily production in the Mid-Continent and California fields, which more than compensate for the decrease in the Coastal Plain and Appalachian fields. Of course, the supply is not inexhaustible, nor is that of coal, but proper conservation gives promise of a steady output for the years to come, that warrants changing existing plants.

The question of cost is local and comparative. For those who pay $4.00 or more per ton for coal there is no question but what oil at $1.00 per barrel is the cheaper. We publish elsewhere an article by Mr. R. F. Chevalier, comparing two tests, each made on the same kind of boiler, under similar conditions, excepting that coal was used at one, while oil was burned at the other. Both were conducted under working conditions, without any special preparations. The comparison shows that the fuel value of oil is $0.042 per gallon when coal is assumed to cost $4.00 per ton. Its fuel cost is but $0.024 on a basis of $1.00 per ton, thus making its value seventy-five per cent greater than its cost. In the coal test, the air excess was 50 per cent, while with the oil it was 5.6 per cent. Subsequently this was reduced to less than 1 per cent. In the coal test, the automatic stokers consumed 5.8 per cent of the steam generated, while the average of the steam used for atomizing does not exceed 5 per cent, and we have several records as low as 2½ per cent. We know of no stoker, either human or automatic, that works as cheaply and as well as an oil burner.

In our endeavor to present the availability of fuel oil for power production, we must not neglect the essential changes in furnace design, necessary to give the best results. Every plant is subject to different conditions, which require a specialist's study to most effectually utilize. No wiser investment can be made than to employ a competent engineer who can read aright what is shown in the flue gas analysis as a measure of boiler efficiency. More can be learned about steam plants by the study of flue gas than by taking indicator cards. It is not what he uses, but what he loses, that should interest an engineer.

As bearing out this contention, we would refer to the evaporation tests detailed in this issue by Mr. R. F. Chevalier. By means of certain modifications in the air admission and distribution, and by changing from the long to a spreading flame, an increase of 4½ per cent was made in the boiler efficiency. Other tests showed an efficiency as high as 81.8 per cent, the best results being uniformly obtained with the spreading flame. That such has been done indicates that the same can be done for other plants that are not getting out of their fuel all that there is in it.

PERSONAL.

H. B. Vanzwoll, secretary of the Sunbeam Incandescent Lamp Company, has proceeded East via Portland and Seattle, on his return from Honolulu.

F. G. Larkin has been appointed Northwestern manager of the Telephone-Electric Equipment Company, with headquarters at Seattle, succeeding H. H. Manny, resigned.

M. M. O'Shaughnessy, consulting engineer of San Diego, has returned south after a brief visit to San Francisco. He reports business good in Los Angeles and San Diego.

TRADE CATALOGUES.

Bulletin No. 31 from the Hyatt Roller Bearing Company, of Harrison, N. J., contains matter of interest to every one concerned with the lessening of friction. It will be sent upon application.

REMOVAL NOTICE.

The Telephony Publishing Company announces its removal to new offices at 342-347 Monadnock Block, Chicago, Ill.

American Circular Loom Company offices have been established at 45 Milk Street, International Trust Building, Boston, Mass.

TRADE JOURNALS CONSOLIDATE.

The "Industrial News," of Oakland, edited by Mr. P. B. Preble, and the "Industrial News," of San Francisco, edited by Mr. L. A. Larsen, have been consolidated. Both these publications are old established journals devoted to the building and industrial activities of the bay counties, and their consolidation makes a very strong combination, both editors being well and favorably known in their chosen field.

PUBLICATIONS RECEIVED.

Volume III, No. 3, Transactions of the Illuminating Engineering Society, contains papers on "Light and Color in Decoration," by George L. Hunter; "Extension of Gas for Illumination," by G. W. Thomson; "Eyesight and Artificial Illumination," by Dr. John T. Krall, and "Daylight Illumination," by L. W. Marsh. In addition to the usual notes and reports, it also contains a list of members.

COMMERCIAL DAY AT THE N. E. L. A. CONVENTION.

One of the subjects on the program for Commercial Day (May 21) at the convention of the National Electric Light Association in Chicago, will be "Advertising," which will be handled by Mr. Chas. A. Parker, formerly editor of the "Booster," which was started by the Co-operative Electrical Development Association. An illustrated lecture will be delivered by Mr. V. R. Lansingh, dealing particularly with store illumination.

POPULAR ELECTRICITY.

Two new journals, each named "Popular Electricity," have reached our desk, one being published by the Popular Electricity Publishing Co., 1116 Fisher Building, Chicago, and the other by the Electricity Publishing Co., 12 W. 40th Street, New York City. Both present the wonders of electricity to the layman in attractive form.

EXAMINATION FOR TESTING ENGINEER.

The United States Civil Service Commission announces the postponement to June 3-4, 1908, of the examination scheduled to be held for "junior engineer" on May 6-7, to secure eligibles from which to make certification to fill from ten to twenty vacancies in the Technologic Branch of the Geological Survey, at salaries ranging from $1,020 to $3,000 per annum, and vacancies requiring similar qualifications as they may occur.

From the register established as a result of this examination, certification will be made in accordance with the ratings received on training and experience, and the salary which the eligible is willing to accept. Those who receive 90 per cent or over on this subject will be eligible for engineer positions at salaries ranging from $2,400 to $3,000 per annum; those who receive a rating on this subject of 80 per cent or over but less than 90 will be eligible for certification to assistant engineer positions at salaries ranging from $1,620 to $2,160 per annum, and those who receive ratings on this subject of 70 per cent or over but less than 80 will be eligible for certification to junior engineer positions at salaries ranging from $1,020 to $1,380 per annum. Promotions from lower to higher grades may be made from time to time at the discretion of the Department.

Temporary appointments to the position of engineering aid or apprentice may also be made from the eligible list resulting from this examination, at salaries ranging from $720 to $960 per annum.

The examination will consist of the subjects mentioned below, weighted as indicated:

	Subjects.	*Weights.*
1.	Elementary chemistry, physics, and mathematics	10
2.	Essay of not less than 500 words on one of the following subjects (both English composition and drawing will be rated on this subject); (*a*) On a mechanical engineering subject, accompanied by drawings; (*b*) on a civil engineering subject, accompanied by drawings; (*c*) on a mining engineering subject, accompanied by drawings	20
3.	Mechanics and dynamics of engineering	10
4.	Engineering special subjects: (*a*) Testing of structural materials, with outline of necessary observations and computations; (*b*) testing of fuels, with outline of observations and necessary computations; (*c*) mining operations, including tunneling, blasting, hoisting, ventilation, shaft sinking etc. (Ten questions will be given under each subject. Not more than one subject may be taken by any applicant)	25
5.	Training and experience (rated on application form)	35
	Total	100

The vacancies to be filled in the junior engineer grade are in three distinct lines of employment: (1) For testing structural materials, for which an educational groundwork corresponding to the degree of civil engineer or B. S. in civil engineering should qualify the applicant; (2) for testing fuels, for which an educational groundwork corresponding to the degree of mechanical engineer or B. S. in mechanical engineering should qualify the applicant; and (3) for the investigation in the field of methods of mining and production of fuels and structural materials and related subjects, for which an educational groundwork corresponding to the degree of mining engineer or B. S. in mining and engineering should qualify the applicant.

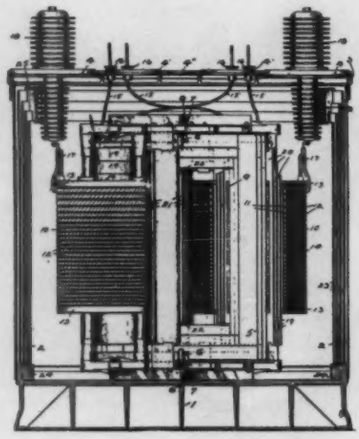
Age limit, 21 years or over on the date of the examination.

Two days will be required for this examination.

PATENTS

TRANSFORMER. 885,034. John J. Frank, Schenectady, N. Y., assignor to General Electric Company, a corporation, of New York.

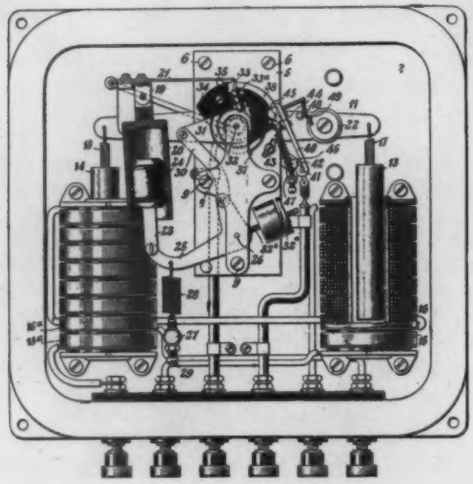
The combination with an electric device containing conductors subject to a high voltage and adjacent to other conductors or conducting material of an insulation surrounding



the high-voltage conductors composed of a plurality of parallel sheets composed of layers of an insulating material and an insulated conducting material, the sheets being successively greater in area as they are successively spaced further from the high-voltage conductors and spaces between the sheets containing insulating fluid.

AUTOMATIC SYNCHRONIZER. 885,143. Frank Conrad, Swissvale, Pa., assignor to Westinghouse Electric & Manufacturing Company.

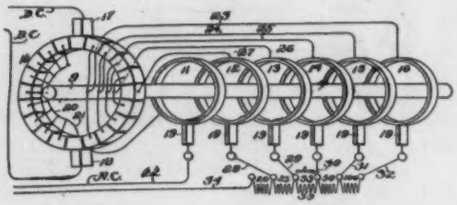
The combination with a pivotally mounted switch member



having a conducting and a non-conducting portion, a pivoted bar having a contact member that co-operates with the switch member, and means for operatively connecting the pivoted bar to the switch member, of another contact member that normally engages the conducting portion of the switch member but becomes disengaged therefrom upon movement of the switch member to an extreme position, means for thereafter maintaining the contact member out of engagement with the conducting portion of the switch member, and means operated by the pivoted bar to cause them to re-engage.

APPARATUS FOR CONVERTING DIRECT CURRENT INTO ALTERNATING CURRENT. 885,394. Frederick F. Strong, Boston, Mass.

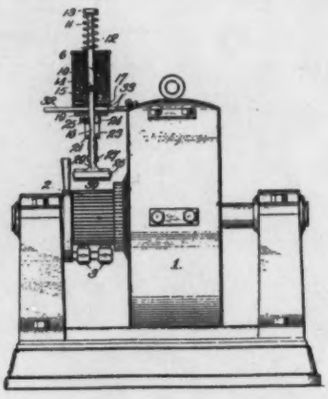
An electric apparatus for converting direct current into alternating current, comprising a rotary commutator, its brushes and feed wires for delivering direct current thereto, and an outgoing circuit including collector rings, brushes and circuit wires for conveying current from commutator, and a plurality



of resistances in series interposed in outgoing circuit, commutator having segments co-operating with brushes to cut out the feed current at predetermined intervals, and segments connected with the rheostat for gradually cutting out the resistance from outgoing circuit and gradually restoring resistance to outgoing circuit in the interval between said predetermined intervals, and means for reversing the feed current at said predetermined intervals.

COMMUTATOR WIPER AND OILER. 885,278. Daniel D. Neville, George H. Clay, and John H. Clewer, Kansas City, Mo.

The combination with a dynamo, of a solenoid having a reciprocatory plunger comprising magnetic and non-magnetic portions united together at their ends and having such union point normally within the field of attraction of the solenoid;

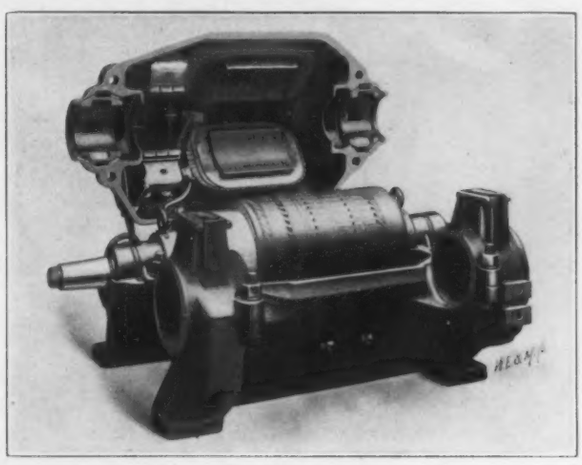


portions projecting at their opposite ends beyond the corresponding ends of the solenoid wiping and oiling means carried by the non-magnetic portion of the plunger, engaging the commutator periodically, a head on the projecting magnetic portion of the plunger, and a spring interposed between head and solenoid to hold head yieldingly away from the solenoid.

INDUSTRIAL

THE WESTINGHOUSE MILL MOTOR.

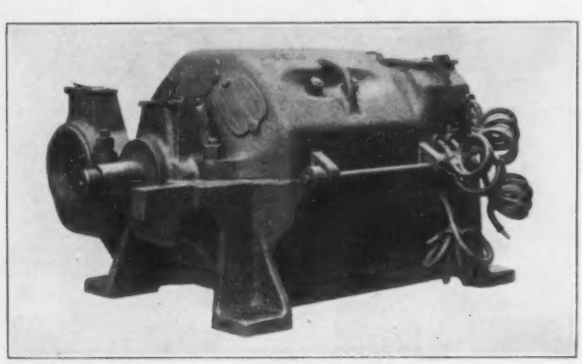
The mill type direct-current motor, which has recently been put on the market by the Westinghouse Company to meet the severe conditions met in steel mills, has been carefully designed after conferences with a large number of prominent steel mill engineers, with a full knowledge of all the electrical and mechanical requirements. The results obtained from the motors



WESTINGHOUSE MILL MOTOR WITH UPPER FRAME RAISED.

which have been tried out in service have been very satisfactory.

These motors are adapted to railroad work, for operating transfer tables, and for bending rolls in the boiler shop. The motor used on the transfer table may be provided with two friction clutches, one of which operates the drum for pulling cars or dead engines onto the table, the other the driving



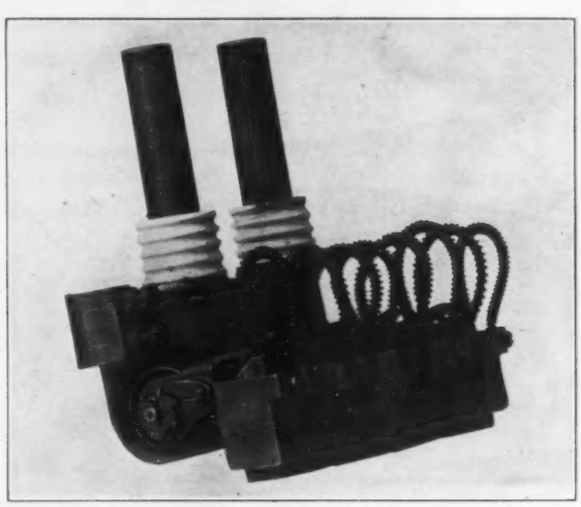
FRONT VIEW OF WESTINGHOUSE MILL MOTOR.

mechanism operating the table. As it is possible to disconnect both clutches at the same time, there may be times when there is no load on the motor, and an ordinary series motor would run at a speed sufficient to cause damage to itself. This motor, however, has a shunt field connection, which limits the no-load speed to approximately double the full-load speed, and prevents any dangerous speeds being reached.

The illustration shows the motor opened for removal of the armature. As shown, the motor frame is divided horizontally, and is hinged, allowing the upper half to be swung back for repairs in the minimum amount of time. The heavy section of the frame insures rapidity and freedom from vibration. The frame is provided with hand holes for inspection of the commutator and windings, but the covers fit tightly and the frame is dustproof. The bearing housing is extended beyond the bearing, and a dustproof construction is secured by means of a steel washer and felt lining.

The dimensions of the shaft are exceptionally large, with keyways of liberal dimensions, and all chance of bending and breaking is eliminated.

A noticeable feature of the bearings is their large wearing surface, which insures long life. The air gap between the fields and the armature is large, and allows considerable wear in the bearings before the revolving and stationary parts could rub. Special provision has been made for preventing oil from being drawn into the armature or creeping along the shaft. The bearings are split and made interchangeable for either end of



BRUSH HOLDER AND BRUSHES OF MILL TYPE MOTOR.

the motor. No dowel pins are used, as lugs cast with the bearings are used to keep them from turning. An eye bolt on each bearing permits ready handling of the armature.

The insulation used on the motors is strictly incombustible throughout, and withstands very high operating temperature without deterioration. Only asbestos, mica, porcelain, and an insulating compound are used for insulating purposes. The coils are treated with the compound and then baked at a temperature far higher than any that will ever be met in actual service.

The carbon holder is of very substantial design, and so constructed that by the removal of one holding bolt the entire holder as one piece can be removed from the motor. The insulation is thoroughly protected from moisture and mechanical injury.

The armatures are wound with strap copper insulated with mica tape, hand wound. This form of coil can be easily repaired by the customer, which is not possible with wire-wound coils, as they are useless if the insulation becomes badly damaged. The coils are held in place by hard fiber wedges and bands, which are below the surface of the laminations.

A NEW FIXTURE FOR TUNGSTEN LAMPS.

The rapid advance of the tungsten lamps is well illustrated by the fact that fixtures especially designed for them are now on the market. Such a fixture is illustrated herewith, and the manufacturer says that it combines the best lamps with the best fixture. The fixture measures twenty-five inches over all. It consists of stem of three-eighths-inch pipe

and three-fourths-inch casing, crowfoot, wires, deep canopy, cluster body, and an eighteen-inch opal reflector. The brass base is provided with conical shape frosted aluminum reflector, which materially increases the reflecting surface of the device. The fixture is furnished with four to six lights, with or without center-lamp opening, and with or without pendant switch. It is symmetrical in outline and pleasing in appearance, and offers an effective, convenient and economical fixture for public-lighting purposes. The device is known as "Benjamin tungsten arc," and is manufactured by the Benjamin Electric Manufacturing Company of Chicago.

THE WESTINGHOUSE MACHINE COMPANY'S EXPORTS.

It is gratifying to note the continued demand from the far East for American machinery manufactured at East Pittsburg. Japanese industries are particularly active in this direction and within a recent period, The Westinghouse Machine Company has booked a large number of orders through their Japanese representatives, Messrs. Takata & Company, of New York and Tokio. Outside of turbines and gas engines, the demand for vertical compound steam engines, a characteristic of Westinghouse construction, is as active as ever.

Three 500 kw. Westinghouse turbines have been shipped to the Imperial Steel Works, Japan, and to the Hakkaido Tanko Steamship Company. The Noble School, Japan, has installed a gas engine producer plant. Four 105 horse power compound engines go to the Taragawa Electric Company, Japan, and to a private isolated plant in China. Other equipments have been ordered by the Acadia Sugar Refining Company and the Yamada Hospital.

Prescott—Water will be brought into the camp of McCracken from Cienega Ranch, and as soon as this is completed a big plant of machinery will be installed at the portal of the big tunnel which the McCracken Company is going to drive. The tunnel is to be double tracked, and two electric engines will be put in to handle the broken ore.

THE KEYSTONE BOILER WORKS.

The accompanying photograph gives an exterior view of the plant of the Keystone Boiler Works at Main and Folsom Streets, San Francisco. This building was put up soon after the fire, and has been used for manufacturing and storage since that time. The Keystone Boiler Works are the agents for the well-known Parker water-tube boilers, which have been installed

with signal success in a large number of local power plants.

This company is also equipped to manufacture boilers, tanks, and all kinds of plate iron work at short notice, making a specialty of marine and stationary boilers. Mr. J. M. Robinson is general manager, and to his genial personality is due much of the success of this company.

CANADIAN CROCKER-WHEELER COMPANY, LTD.

One of the signs of returning confidence in the business situation is the organization of the Canadian Crocker-Wheeler Company, Ltd., for the manufacture and sale in Canada of the well and favorably known Crocker-Wheeler apparatus. The Crocker-Wheeler Company, Ampere, N. J., manufactures all types of direct current and alternating current motors and generators, power transformers, motor generator sets, frequency changers, etc., some of the best known lines being direct current motors for special purposes, such as machine tool and printing press drive, and steel mill work. For the latter, a line of motors has been specially developed, which has been found to meet fully the very severe conditions which exist in steel mills. Crocker-Wheeler alternating current generators up to 2,000 kilowatt capacity have been in successful operation in Canada for some years.

F. E. Lovell, president of the new company, is a member of the old established lumbering firm of H. Lovell & Sons, of Coaticocke, Que., who have extensive interests in mills and timber limits throughout the Province of Quebec. Russell A. Stinson and F. Jno. Bell, vice-president and secretary-treasurer respectively, have been identified with the manufacturing, construction, and sales ends of the electrical trade in Canada for the past fifteen years, and are particularly well known in Montreal, where the head office of the company has recently been opened in the street railway chambers, Place d'Armes Hill.

NEWS NOTES

OIL.

Santa Barbara.—The Associated Oil Company is spending nearly $100,000 for 8-inch pipe line to connect with the 8-inch line that runs from the Santa Maria field to Alcatraz landing.

Los Angeles.—The City Council is holding over for one week two franchises for pipe lines asked for by the Union Oil Company of California. The company has a franchise over Wilshire Boulevard, which it agreed to surrender if others asked for were granted.

Riverside.—Superintendent Harwood Hall, of Sherman Institute, requested and was granted permission to lay a pipe line down Jackson Street, connecting the Santa Fe tracks to the school grounds, for the purpose of conducting distillate to tanks from the switches near Jackson Street.

City of Mexico, Mexico.—The contract for the construction of a narrow-gauge railroad, which the Oil Fields of Mexico Company will build from Furbero to Tuxpam in the State of Vera Cruz, has been let, and the work will be started immediately. The railroad is expected to be finished within 12 to 15 months, and their pipe-line contract will be let in England, but not until President Percy N. Furber goes to London.

Fresno.—Much excitement has been caused here on account of the reported strike of oil near Clovis, ten miles northeast of this city, near the Sierra foothills. High-grade oil and chunks of asphalt have been pumped from an ordinary water well two miles north of the town, and oil of a low grade has been found in a water well on another ranch two and a half miles east. As a result, ranchers in the vicinity are organizing companies to bore wells to ascertain if the petroleum can be found in paying quantities.

Los Angeles.—What is considered another move on the part of the Standard Oil Company to enter the producing business in California is the arrival of Col. J. J. Carter, head of the oil-producing department of that trust, in Los Angeles. It is said that he comes to direct the developments of new fields of the Standard in California, particularly in Monterey and San Benito Counties. The Standard continues to invest in prospective oil lands wherever opportunity offers. It has just purchased another 40 acres in Monterey County, paying $15,000 for it.

TRANSPORTATION.

Los Angeles.—The Board of Public Works is receiving bids for furnishing the city materials and supplies consisting of wire-rope tramway.

Stockton.—The City Council has passed an ordinance granting a franchise for an electric railroad to the Central California Traction Company.

Chihuahua, Mexico.—Felix Martinez, of El Paso, Texas, proposes to build an electric railroad to connect the two Mexican towns of Juarez and El Vallo.

Ventura.—Frank Packard, who with Mr. Jones, of Los Angeles, secured a franchise to build an electric road to Matilija, is in Ventura making arrangements for preliminary work.

San Bernardino.—The Board of Supervisors has granted the petition of A. G. Hubbard, of Redlands, for an electric railway franchise east on Barton Avenue from Redlands to the westerly line of California Street.

San Francisco.—The Parkside Railway franchise was passed without objection. The new franchise was found necessary in order that the route might be shifted from Nineteenth Avenue for a great portion of its length to Twentieth Avenue.

Modesto.—An interurban railway through Stanislaus County to form the nucleus for a line from the coast via Pacheno Pass to the Nevada mines by way of Mono Pass is being projected by John Hays Hammond.

Santa Cruz.—General Manager F. E. Fitzpatrick, of the Coast Counties Power Company, says that the Sequel extension will be completed to the corporate limits within the present year. Another steam turbine is to augment the capacity of the plant at the beach.

Chihuahua. Mexico.—Walter M. Brodie, chief engineer of the Batopilas Mining Company, is waiting for the materials for the aerial tramway for transporting wood and timber from the mountain down to Batopilas. As soon as the materials arrive, the middle section, about five miles long, is to be built. The tramway will be ultimately 12 miles long.

ILLUMINATION.

Gridley.—The vote on the question of a municipal electric lighting plant and water system in this town was favorable.

Pasadena.—The Beaumont Gas & Electric Company has purchased a block containing 3.75 acres in Beaumont as a site for a generating plant.

Escondido.—The stockholders of the Escondido Mutual Water Company will establish an electric light and power plant. The estimated cost of the plant is $30,000.

Ontario.—The City Council has granted a franchise to Robert Weiss to lay gas pipes in the streets and thoroughfares of this place for the purpose of carrying and distributing gas for light, heat and power.

Yerington, Nev.—The telephone system of this place changed hands last week, when J. I. Wilson bought the controlling interest in the company. An extension of the system to the new mining camps of Mountain View and Granite is one of the plans of the new management, and it is also intimated that considerable improvement along the line already established will be made.

ELECTRIC RAILWAYS.

Palouse, Wash.—The city will put in an extensive sewer system in the north side of town.

Olympia, Wash.—The city is preparing to improve a number of streets in the upper Main Street district.

Victoria.—The directors of the British Columbia Railway Company contemplate the expenditure of over two million dollars in and around Victoria. This statement was made by A. T. Goward, manager of the local branch of the concern.

Spokane, Wash.—It is reported here that the Pacific Traction Company is planning to extend its line to American Lake around to the encampment grounds on the opposite side of the lake some time this Summer.

Spokane, Wash.—The Spokane & Inland Empire Railway has applied for a franchise to construct a street car line on Mendenhall Avenue (East Riverside), which is to be an almost direct line to the gate of the Interstate Fair grounds.

Sumner, Wash.—Agents of the Puget Sound Electric Railroad Company are securing right of way for the new electric line to Seattle by way of Puyallup and Sumner. Several condemnation suits have been started, and purchases of right of way have been made outright.

Livingston, Mont.—P. A. Williams, of Chicago, has made application to the City Council for a franchise to operate in Livingston a central hot water heating plant. It is proposed to have a central heating plant with sufficient capacity to supply heat to all business houses, and a large per cent of the dwellings and public buildings.

its franchise to this part of Williams Avenue, according to an opinion given by City Attorney John P. Kavanaugh. An ordinance is being prepared by Kavanaugh to be introduced into the Council to accomplish this, because of the demands made by residents in the district affected who want the company to build or give some other company an opportunity.

Boise, Idaho.—Work has been commenced on an extension of the Boise Valley Electric Railway, from the Boise-Nampa branch to Meridian. It is expected to have cars running into that place within sixty days. Meridian is a station midway between Boise and Nampa on the spur of the Oregon Short Line that extends from Nampa, the junction, to Boise.

Puyallup, Wash.—The new short line of the Tacoma Railway & Power Company between Puyallup and Tacoma this year is an assured fact. Officials state that in view of the large amount of money already invested and the $30,000 it will be necessary to spend for material and labor before the middle of June, outside of Puyallup, it would be folly to let the road lie idle.

Billings, Mont.—An electric railroad will be constructed from Billings to Cooke City by way of Columbus, and work on the line will soon begin. The Stillwater Power Railway Company is to build and equip an electric railroad to the place mentioned, and to extend branches to Yellowstone, Sweet Grass, Carbon and Park Counties. The capital stock of the company is $3,000,000, and among the seven directors are William Bennett of Helena, and George H. Savage.

Portland, Ore.—The contracts awarded for public improvements at the adjourned meeting of the city executive board were as follows: Broadway, $749.50; Failing Street, $15,802.28; Mason Street, $18,535.98, Star Sand Company; East Eighth Street, $79.79; Curtis Street, $5,277.66; East Forty-first Street, $1,833.90; East Nineteenth Street, $5,020.69; East Twenty-second Street, $21,006.67; East Twenty-third Street, $12,081.69; Knott Street, $35,790.40, Barber Asphalt Paving Company; Haven Street, $4,430.82, Joplin & Meeks; East Sixth Street, $1,333.90; Jordan Street, $2,086.78, R. J. Debuhr; Cherry Street, $830.04, Charles E. Pottage; East Third Street, $10,212.45, Pacific Bridge Company; Broadway, $3,514.49, Charles E. Pottage; Clinton Street, $993.22; East Twelfth Street, $10,046.25; Giebisch & Joplin.

FINANCIAL.

San Francisco.—The Mercantile Trust Company of San Francisco invites bids for the sale to it on the 22d of May of a sufficient amount of first consolidated mortgage 5 per cent sinking fund 30-year gold bonds of Bay Counties Power Company for the investment of $24,897.

Vallejo.—An ordinance has been passed by the trustees, calling a special election for the purpose of submitting to the municipal corporation the proposition whether or not the city shall incur a bonded indebtedness of $85,000 in order to obtain the money necessary to defray the cost of enlarging and extending its present waterworks supply.

San Diego.—A motion is now on foot for the sale of the remaining bonds of the recent municipal issue, $210,000 worth of which have already been sold to the Staats Company, of Los Angeles. The bonds still undisposed of amount to $369,559. It is possible that the bonds sold to the Staats Company will be resold, as the matter is still in litigation and the buyers have asked for a conference. With the Staats bonds out, there yet remain to be sold bonds aggregating $369,559.

Los Angeles.—Out of the $10,000,000 Union Oil Company, the Los Angeles capitalists in control are preparing to build one of the largest corporations ever chartered in California. Its present capital will be increased to $50,000,000. For several weeks the project has been taking shape, and at the directors' meeting to be held at Oleum early in May, a plan will be reported and adopted to consummate it. The Union Oil Company has outgrown its present capitalization is the reason given for the projected increase. The company's net earnings last year were $2,080,771. The year before the annual statement showed the earnings to be $1,029,478, or less than half the dividend rolled up in the twelve months just gone by. Prior to the last meeting of the Union's directors, the proposition to increase its capital stock had been agitated, but it was only then that the first formal submission of the project was made. Already it controls nearly 214,000 acres in the Santa Maria field in Santa Barbara County; the Hartnell pool and the Stearns lease in Orange. These holdings represented an increase of 52,000 acres over the total of 1906. But following the policy of expansion the officers of the Union proposed buying another oil tract in Santa Barbara. This was approved, and a deal was closed through which the Union is now possessed of 4,000 more acres in Santa Barbara, the price paid being $450,000.

TRANSMISSION.

Placerville.—M. P. Dart has filed notice of a claim to 500 inches of water flowing in the lower Iowa Canyon for power, irrigation, and domestic purposes.

Yuba City.—An application has been received by the supervisors from the Great Western Power Company for a franchise to construct and maintain a power line across certain streets, alleys and highways in Sutter County.

Weaverville.—The North Mountain Power Company contemplates installing another power plant to supplement the one now operated by it on the Trinity below Junction City. The site of the proposed plant is at Big Flat, about eight miles below North Fork. The surveys have been made and the necessary plans adopted.

Placerville.—The supply ditch of the American River Electric Company went out three miles above the power plant on the river last week and 15 men were taken from here to repair the damage. A section covering about 100 feet in length sloughed off into the canyon. A flume will be built, which will require several days to construct, and meanwhile the water in a reservoir is being used for power. This company just spent $10,000 for repairs.

Redding.—At the last meeting of the city trustees, the Northern Light & Power Company made formal application for a franchise giving it permission to erect pole lines and stretch wires through the streets and alleys of the city for a public purpose. The company is well along with its construction work and will be ready for business by the end of the year. The Northern Light & Power Company will be the third electric light and power company in Redding, the Northern California Power Company and the Shasta Power Company already doing business there.

Wenatchee, Wash.—The Valley Power Company plans to develop a large water-power proposition on the Wenatchee River, five miles above Cashmere, 15 miles from here. The site of the power plant is near the present intake of the High Line Canal. The intake of the high-line ditch will be moved up the river a couple of miles farther to give sufficient fall, and the ditch itself will be widened and given a concrete bed. Competent engineers say that 4,000 horsepower can be developed at this place. It is expected that the company will be in a position to distribute electricity in the city by the early fall. Fully $100,000 will be expended on the plant and the work. F. M. Schoble is president of the concern and W. T. Clark vice-president.

WATERWORKS.

Hollywood.—A committee has been appointed to investigate and report on the proposition of a municipal water plant.

Bishop.—The contract for the supplies for the extension of the water system has been awarded to Leece & Watterson for $1,178.76.

Brawley.—Extensive improvements are to be made in the domestic water system for Brawley, including a centrifugal pump with a capacity of 9,000 gallons an hour on a 60-foot lift.

Oakland.—Judge Ellsworth has declared that the Oakland Board of Public Works has acted legally in accepting the bid of the Doak Gas Engine Company for the construction of a $45,000 pumping plant.

Beaumont.—The San Gorgonio Water Company has let the contract for the machinery of their plant to the Western Gas Engine Company, of Los Angeles. This company will install a 90-horsepower engine and Ingersoll-Rand compressor and air pump.

Santa Barbara.—Funds to continue work on the water tunnel which the city is driving through the Santa Inez Mountains are assured by the sale of $36,000 remaining of the old bond issue. James P. Adams & Co.. of Los Angeles, was the highest bidder.

San Francisco.—Marin County is to have an increased water supply through the plans of the Marin County Water & Power Company, controlled by A. W. Foster, A. B. McCreery, P. N. Lilienthal, and G. A. Newhall, by the installation of a reservoir with capacity of 3,500,000,000 gallons.

Kingman, Ariz.—Judge A. A. Sturgis and M. J. Spencer, of Los Angeles, have closed a deal whereby it is proposed to bring the waters of Walnut Creek to Gold Flat. A survey has been made of the proposed route, and it is found that a line 7 miles in length will be necessary. The pipe will be 10 inches, reduced to 6 inches at discharging. Colonel Morgan, who is putting in a milling plant at old Red Hills mines, is to be interested in the enterprise and will take considerable of the water for his plant.

TELEPHONES.

Reno, Nev.—The telegraph and telephone lines of the Fairview-Rawhide Telephone & Telegraph Company and the Rawhide-Schurz Telephone & Telegraph Company have been combined, and in the future all messages between Reno and Rawhide will go over one wire, and one rate will be charged. It is stated that the consolidation of the two companies will probably result in a reduction of the telegraph tolls between Reno and the new mining camp of Rawhide.

Oakland.—The United States authorities visited the offices of the Oakland Transcontinental Aerial Telephone & Power Company recently and arrested six of the promoters of what is alleged to be one of the most flagrant swindles of a decade. The offices of the company were located in rooms 203-204, Union Savings Bank Building, and the men taken into custody were Albert Janke, inventor and president; Harry P. Dwyer, vice-president; Wade H. Shadburn, secretary; Albert G. Rockel, treasurer; W. H. and J. B. Allen and Dr. R. W. Bardachy, solicitors. The concern has been under the surveillance of the police since last February, but owing to the fact that Captain Peterson, chief of the Oakland detectives, was unable to get any of the people who had put their money into the enterprise to swear to a complaint against the officers of the company, he was obliged to turn the matter over to Postal Inspector James O'Connell, who soon had sufficient proof against the men to warrant their arrest on a charge of using the United States mails to defraud.

TELEPHONES.

Spokane, Wash.—Announcement is made in Spokane by J. A. Vandyke, manager of the North Idaho Telephone Company, of Wallace, that the fight between his concern and the Interstate Telephone Company, of Spokane, both independent, for supremacy in the Coeur d'Alene mining district, east of Spokane, has come to an end. The North Idaho Company will conduct the local exchanges, while the Interstate Company will handle the long distance business, connecting with the local exchanges.

The Interstate has a line from Spokane as far as Sweeney, Ida., extending it to Wallace. Mr. Vandyke says the local exchange in Kellogg and toll office in Wallace will be opened in May, and that work on the Wallace exchange will be rushed. The Interstate Company will continue its line on to Missoula and other Montana points. The Interstate has bought a pole line from Kellogg to Wallace. The lines to Mullan, Burke, and Gem, Ida., will be in operation in October.

Farmers in the wheat belt, south of Spokane, and the Snake River, have organized the Penawawa Telephone Company, Limited, to construct and operate the most extensive system of rural telephone lines ever operated in this part of the Northwest. The officers are: Silas Smith, president; Herbert Smith, secretary-treasurer, and W. F. Adams, Niles Champlin, and Guilford Miller, directors, all of Colfax, Wash. The lines now under construction will cost $4,000. The line starts from the Pacific States long distance office in Colfax, and is strung on this company's poles as far as Plainville, four and a half miles south of Colfax, from which point there are poles erected. From Plainville to the head of the Little Penawawa, 12 miles, runs the trunk line, known as the Major's Station, there will be an office, a switchboard, and day and night operators, so that the branch line subscribers, as well as those on the main line, will be enabled to get connection with the long distance office at Colfax. To this station the line will be equipped with six metallic circuits. From the Major's Station three lateral lines leave the trunk line, one runs to La Crosse, one to Penawawa, and the other, called the Adams-Champlin line, within four miles of Almota. The La Crosse branch is 30 miles in length, carries six metallic circuits and accommodates 100 subscribers. It is the intention to eventually extend this branch to Hooper and Kahlotus. The Adams-Champlin branch is seven miles long, has one ground circuit and accommodates 10 subscribers. It is possible to switch at the Henry Hickman farm on this line, so that communication may be had with the Almota long-distance office, and also with what is known as the Moys neighborhood, over the Moys line. Penawawa line is 14 miles in length, and has two metallic circuits and connects 24 instruments.

Assessed valuation of the telephone and telegraph lines in Umatilla County, Oregon, southwest of Spokane, has doubled 26 times, while the actual length of the lines has increased from 321 to 844 miles. The lines were assessed at $20,595 five years ago, while last year the figures were fixed at $549,040. Much construction has been seen in the rural sections, connecting farming districts with Pendleton and other towns, making a network of lines connected with the long-distance system, which extends to all points of importance in the country. Some telegraph lines have been constructed along the railway between Pendleton and Pilot Rock, and in other places. Inasmuch as the telephone business has been created within the last few years, this showing is considered as almost without an equal anywhere in a country of small towns and large wheat farms.

Lower rates on two-party lines have been established by the Pacific Telephone and Telegraph Company. The new rate gives former subscribers on a two-party line an extension telephone in addition to the original instrument at the rate formerly charged for a single instrument. Until a short time ago, the company charged $2.50 a month for connection on a telephone line supplying two subscribers, and 50 cents additional for an extension phone. It now makes a rate of $2 a month for a single instrument, and 50 cents a month for the extension, supplying both instruments at the rate formerly charged for one.

Patrons of 14 farmers' telephone lines in the Nez Perce country, southeast of Spokane, decided recently to join the Nez Perce Co-operative Telephone Company. The fight has been waged between the Pacific Telephone Company and the independent concern for several weeks, as representatives of both lines have been soliciting subscribers. G. Bingham, superintendent of rural lines for the telephone company, sought to induce the farmers to join his company and as an incentive cut the monthly switching charges to 20 cents, which is 5 cents cheaper than the co-operative company performs the service.

Thirty-seven hundred instruments will be served by the Pacific Telephone Company's new sub-station at Sinto Avenue, in Spokane, to be opened in June. Preparatory to using the new exchange the company is having printed a new telephone directory, in which the telephones connecting directly with the North Side exchange will have the prefix "Maxwell." The company will build another exchange on the north side.

The Yakima Valley Telephone Company will move its exchange from Parker to Wapato, Wash. The necessary stock to effect the change was subscribed among the business men here in a few hours. S. J. Harrison, of Sunnyside, has agreed to issue stock for that amount to local business.

Charles P. Lund, of Spokane, has become owner of the telephone system at Cheney, Wash. The Pacific States Telegraph and Telephone Company owned and operated the exchange for a number of years. Last Summer, when the commercial club insisted that a better equipment should be installed and a better service rendered, the company offered to sell the exchange because they did not care to make further improvements here. The exchange then passed into the hands of W. T. Du Bois, former manager of the company. Mr. Lund will make improvements in the way of putting in new office equipment and extending the lines. It was through the efforts of Mr. Lund, who is president of the Board of Trustees of the Washington State Normal School, that Cheney secured the electric line recently completed by the Washington Water Power Company, of Spokane.

The directory just issued by the Pacific States Telephone and Telegraph Company in Spokane contains 10,700 names, although the company has 12,800 instruments in operation. This is a high percentage for a city of 100,000. The difference is accounted for by the number of firms which have more than one telephone.

Farmers in the vicinity of Forest, Ida., have organized a telephone company, and have secured permission to connect with the Nez Perce Co-operative Telephone Company, at Ilo. Several farming communities having more than 200 miles of line, with 1,000 instruments installed in the Lewiston country, are seeking service.

WATERWORKS.

Santa Cruz.—Supervisor Linscott has been authorized to purchase 3,000 feet of 1¼-inch water pipe for the Pajaro road district; also to build two new 6,000-gallon water tanks.

San Francisco.—A meeting of the stockholders of the Camino Real Water Company will be held in the Crocker Building, San Francisco, on June 22d.

Lewiston, Ida.—At a meeting of the City Council application was made for the lease of a tract of land lying along the Clearwater River near the city pumping station, to be used as the site for a temporary power plant for the North Coast Water & Power Company.

Oceanside.—The City Trustees have awarded the National Wood Pipe Company the contract for 10,400 feet of wood pipe and fittings, their bid being 29⅝ cents per foot. The Trustees have also accepted the bid of the American Steel Pipe & Tank Company for 3,400 feet of riveted pipe for the sum of $590.

-Klamath Falls, Ore.—H. V. Gates, president of the Klamath Falls Light & Water Company, will be here the latter part of April to complete plans for commencement of work on additions to the system. The reservoir to be put in Moore's addition will have a capacity of 200,000 gallons, and the one at the Hot Springs will be about 300,000 gallons. Work is planned to begin in May. A large amount of new pipe and mains will be required.

Yuba City.—The Town Trustees have had Surveyor Guy McMurtry make estimates upon the cost of an up-to-date waterworks system, and, after several days' investigation, Mr. McMurtry has reported that an excellent system can be installed for not more than $25,000. This will include the construction of a steel tower seventy feet high, with concrete foundation, and an 80,000-gallon tank, six and eight inch mains laid on all the principal streets, and the installation of electric power, with steam or gasoline power as an auxiliary.

Portland, Ore.—At a meeting of the water board, City Attorney Kavanaugh was instructed to take up the city's rights on the Bull Run River with Senator Fulton to prepare an act that will insure the city absolute rights in the reserve. When in Portland last fall, he promised his support to the project, and with City Attorney Kavanaugh will draft an act to accomplish this object. Members of the board have voted for the erection of a pumping station on Council Crest to furnish residents in that vicinity with water. The station is to have a capacity of 250,000 gallons per day. Bids will be advertised for and work started as soon as possible.

Woodland.—Work on the Moore dam has been completed, and the Yolo Consolidated Water Company has commenced to supply water to those who want to irrigate. About 30 feet of water was turned into the Moore ditch the first day. This is all that is necessary for the present purposes. The volume could be increased to 100 feet if necessary. Work has been commenced on the dam for the Adams ditch and the Winters canal. The Adams ditch dam site is about a mile above Capay, while the dam for the Winters canal is about three miles above Capay. It will be two or three weeks before these dams are in such a condition that the water can be turned into the ditches.

TELEPHONE.

Bickleton, Wash.—W. J. White, of the Goldendale Telephone Company, was here lately in an effort to organize a company to construct a telephone line from here to Goldendale.

Rock Creek.—The Star Telephone Company recently held its annual meeting. The following officers were elected for the ensuing year: President, Herman Oest; vice-president, E. O. Gassaway; treasurer, William Cramer; secretary, J. W. Clarke; assistant secretary, E. E. Ridinger.

Eureka.—Manager E. A. McLaren, of the Pacific Telephone Company, of this city, has announced that a new building for the Eureka system will be constructed this spring on the company's property, located on the northwest corner of Sixth and F Streets. An expert is at present engaged in estimating the cost of the contemplated structure, and is working out plans for the new building.

San Francisco.—Chief Electrician Whorf, of the Harbor Commission, has recommended that a wireless telephone station be installed in the Ferry Building during the time of the fleet's visit. The wireless telephones on the battleships are the same as the ones to be maintained in the Ferry Building, and the shore station is required only to afford the fleet communication with the land, and is not for commercial purposes.

San Francisco.—General Manager E. J. Nally, of the Postal Telegraph and Cable Company, has made arrangements with the Southern Nevada Telegraph and Telephone Company to use the lines of the latter company in southern Nevada, and has closed a contract with local contractors to construct other lines for the Postal Company in Nevada. Manager Nally says the Postal Telegraph Company will follow the line of the Santa Fe Railroad to Rhyolite, and from that point will later extend lines into all portions of Nevada and compete with the Western Union.

ELECTRIC RAILWAYS.

Seattle, Wash.—Councilman Wardall introduced an ordinance granting a franchise to the Seattle Electric Co., to extend its street-car line to Alki Point.

Steptoe, Wash.—A corps of engineers in the employ of the Spokane & Inland Empire Railroad Company is selecting a route from the town of Steptoe to the top of Steptoe butte.

Monroe, Wash.—Actual construction work has been begun on the line of the Snohomish Valley Railroad Company's trolley road, which, the promoters say, will be built this season from Snohomish, a distance of fifteen miles to a point eight miles south of Monroe. Negotiations which have been under way for some time past have resulted in the sale of the bonds and the raising of the cash for this part of the projected line.

North Yakima, Wash.—Building of an interurban system, which will network the Yakima Valley, connecting all the principal cities and towns, is planned by the Yakima Valley Transportation Company. That the company will build seventy miles of electric railroad at an approximate cost of $2,000,000 has been announced by the men interested in the local company, who now have a three-mile road in operation over Nob Hill. A. J. Splawn, one of the pioneer ranchers of the Yakima Valley, is president of the company, and G. S. Rankin is vice-president and general manager.

FINANCIAL.

Yuba City.—The water works bond election in this place has been carried.

Santa Cruz.—Councilman Faneuf reported that the cost of a 100-light generator for the electric light plant would be $2,720.

Santa Cruz.—The City Council has decided to consider calling a $200,000 bond election for sewers, bridges, wharf, and an electric light plant.

Portland, Ore.—According to President E. P. Clarke, of the Mount Hood Railway and Power Company, they are prepared to invest from $10,000,000 to $15,000,000 in their property.

San Francisco.—The Big Creek Light and Power Company, now a subsidiary of the Coast Counties Power Company, has executed a deed of trust to the Mercantile Trust Company. A. H. Winn is trust officer.

Seattle, Wash.—The executive committee of the City Council has approved of the ordinance authorizing the issuance of water bonds in the sum of $2,500,000, and the comptroller is authorized to make all arrangements for the disposal of the securities.

Los Angeles.—The electrical contracts, totaling nearly $9,000, have been let by the City Council, on the recommendation of Manager Koiner, of the municipal electric light plant. Of the amounts mentioned, the California Electric Company gets $2,464.50; B. F. Kierulff, Jr. & Co., $5,843; and J. A. Roebling Sons' Company, $84.42.

Oakland.—Louis S. Beeby, vice-president of the Home Telephone Company, has sent to the auditing and finance committee of the City Council his report of the expenditures made by his company in this city between April 2, 1906, and April 1, 1908, and the report shows that $850,000 has been expended. Mr. Beeby states that the $850,000 has been spent by his company in the purchase of land, the erection of buildings, and the establishment of a system.

OIL.

Los Angeles.—Judge James, of the Superior Court, has made a ruling virtually sustaining the validity of the corporation franchise assessment provided for under a State law, and taken advantage of here to such an extent that many companies have moved their headquarters out of this county. The Western Oil Company sued for a refund of $10,000 taxes paid under protest, and the county demurred on the ground that the complaint did not constitute a cause of action. This the court overruled, the effect of the decision being the validation of all similar assessments. The oil company maintained that, if assessable, the franchise should have been taxed in Santa Barbara County, where its plant is situated, and that it was assessed at 1,000 times its valuation.

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